Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

June 15, 2006

TVA-BFN-TS-431
TVA-BFN-TS-418

10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop OWFN, P1-35
Washington, D. C. 20555-0001

Gentlemen:

In the Matter of	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
	)	50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - UNITS 1, 2, AND 3 - TECHNICAL SPECIFICATIONS (TS) CHANGES TS-431 AND TS-418 - EXTENDED POWER UPRATE (EPU) - RESPONSE TO ROUND 5 REQUEST FOR ADDITIONAL INFORMATION (TAC NOS. MC3812, MC3743, AND MC3744)

By letters dated June 28, 2004 (ADAMS Accession No. ML041840109) and June 25, 2004 (ML041840301), TVA submitted applications to the NRC for EPU of BFN Unit 1 and BFN Units 2 and 3, respectively. This letter provides TVA's response to the NRC staff's June 2, 2006, Round 5 Request for Additional Information (RAI) (ML061460137) in support of the BFN Units 1, 2, and 3 EPU license amendment requests. Enclosure 1 to this letter provides responses to each of the ten questions that are contained in the NRC staff's RAI.

TVA has determined that the additional information provided by this letter does not affect the no significant hazards considerations associated with the proposed TS changes. The proposed TS changes still qualify for a categorical exclusion

D030

from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9).

A new regulatory commitment is made in this submittal. Enclosure 2 summarizes the commitment regarding future inspections of top guide components.

If you have any questions regarding this letter, please contact me at (256)729-2636.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 15th day of June, 2006.

Sincerely,

William D. Crouch

William D. Crouch
Manager of Licensing
and Industry Affairs

Enclosures:
1. Response to Round 5 Request for Additional Information
2. Commitment Summary

cc: (see page 3)

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ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3

TECHNICAL SPECIFICATIONS (TS) CHANGES TS-431 AND TS-418 - EXTENDED POWER UPRATE (EPU) - RESPONSE TO ROUND 5 REQUEST FOR ADDITIONAL INFORMATION (TAC NOS. MC3812, MC3743, AND MC3744)

(SEE ATTACHED)

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3

TECHNICAL SPECIFICATIONS (TS) CHANGES TS-431 AND TS-418 - EXTENDED POWER UPRATE (EPU) - RESPONSE TO ROUND 5 REQUEST FOR ADDITIONAL INFORMATION (TAC NOS. MC3812, MC3743, AND MC3744)

This enclosure provides TVA's response to the NRC staff's June 2, 2006, Round 5 Request for Additional Information (ADAMS Accession No. ML061460137).

NRC Request EEEB.8

In a recent incident, a nuclear power station operator was requested by the local Reliability Council to roll back generator power output to the pre-extended power uprate (EPU) level because adequate post-trip voltages at the safety buses could not be supported if the generation was at the EPU level. In view of the above, please provide a discussion on how BFN EPU power levels have been co-ordinated with the area Reliability Council to assure that tripping of these units at the EPU level will not cause inadequate post-trip voltages at the safety-related buses.

TVA Reply to EEEB.8

TVA is an integrated utility where the transmission system is owned and operated by TVA's owner-operated grid operations known as the Power Systems Operations (PSO) group. Down-powering is not an option that is currently designed into the PSO grid operating guides to assure offsite power adequacy. Instead, PSO manages planned transmission line outage schedules and establishes minimum voltage levels based on system loading and configuration. Unless there is an unplanned trip of a major 500-kV transmission line, any necessary down-powers (either due to grid reliability concerns or unacceptable generator angular instability) would be pre-scheduled and coordinated with plant maintenance activities.

BFN has coordinated with the PSO Transmission Planning organization the EPU power levels, post-trip plant loading data, generator capabilities, and switchyard voltage acceptance criteria. PSO evaluated a range of grid conditions and identified bounding parameters (e.g., lines and transformers in service, system loading, and voltage levels) that will ensure the ability of the grid to meet the minimum switchyard voltage requirements during a unit trip with a postulated design basis event. PSO also investigated the need for system enhancements, including additional static and dynamic reactive sources in the

region around the BFN plant, resulting from the restart of BFN Unit 1 at EPU and EPUs of BFN Units 2 and 3. PSO concluded that at the post-EPU generator reactive output levels, no additional reactive sources were required to meet minimum post-trip voltage requirements and that the post-EPU reactive contribution to the grid from the BFN generators was sufficient.

NRC Request EEEB.9

State the differences between pre- and post-EPU Megavolt-ampere reactive (MVAR) capability for the BFN generators and the obligation of the BFN units to supply MVARs to the transmission system in order to assure adequate post-trip voltages at the safety buses.

TVA Reply to EEEB.9

The generator reactive power capability is a function of the generator hydrogen operating pressure, operating real power, and the generator capability curve. With consideration of the average operating hydrogen pressure, the operating real power, and the generator capability curves, the reactive power capability for pre-EPU and post-EPU conditions is summarized in Table EEEB.9-1 below.

Table EEEB.9-1

	MVAR at Generator Terminals		
	Unit 2 and Unit 3		Unit 1
	105% OLTP	120% OLTP (EPU)	120% OLTP (EPU)
	Reduced H_2 Pressure	75 psig H_2 Pressure	75 psig H_2 Pressure
Generator Reactive Power Capability at Rated Real Power	300 / -150	200 / -150	360 / -150
Credited Reactive Power Capability for Post-Event Evaluated in Transmission Studies	300 / -150	200 / -150	360 / -150

This information is used by TVA's PSO Transmission Planning organization along with plant post-trip load data and voltage acceptance criteria so that the proper stability and loadflow/voltage studies could be run as part of the BFN EPU Grid Adequacy and Stability Study. The obligation of the BFN units to supply MVARs to the transmission system in order to assure

adequate post-trip voltages at the safety buses are those credited in the Transmission System Planning Study shown above. This study establishes that grid voltages (both pre- and post-unit trip) satisfy the offsite power voltage acceptance criteria for the site. Plant studies show that the post-trip voltages at the safety buses remain adequate when the offsite power voltage acceptance criteria are met.

NRC Request EEEB.10

In Section 10.3.1.1 of NEDC-33101P regarding Environmental Qualification (EQ), it is stated that 1) normal temperatures are expected to increase slightly, but remain bounded by normal temperatures used in the EQ analysis, 2) the post-accident peak temperature and pressure do not significantly increase for EPU, and 3) the long-term post-accident temperatures inside containment increase, however the increase was determined not to adversely effect the qualification of safety-related electrical equipment. Specify the temperature and pressure before and after EPU and demonstrate that the increase is within the design margin of qualification of the electrical equipment.

TVA Reply to EEEB.10

The safety-related electrical equipment was reviewed for EPU to ensure that the existing environmental qualification (EQ) for the normal and accident conditions, expected in the area where the devices are located, remains adequate. PUSAR Section 10.3.1.1, "Inside Containment," reflects the evaluation of EQ-related equipment inside the containment building under EPU conditions. Further discussion of the information provided in PUSAR Section 10.3.1.1 is provided below. BFN Unit 1 has been in an extended shutdown, and the EQ program will be re-established to meet the current EQ program for BFN Units 2 and 3. As such, the effects of EPU on the EQ program are provided by comparison between the current licensed thermal power (CLTP) and EPU conditions for BFN Units 2 and 3.

EPU EQ analyses for equipment located inside containment:

1) NEDC-33101P states that normal temperatures are expected to increase slightly, but remain bounded by the normal temperatures used in the EQ analyses. The maximum normal temperatures for the drywell and wetwell used in the EQ analyses are 147°F and 95°F, respectively. These values actually remain the same for CLTP and EPU conditions; therefore, there is no effect on equipment qualification.

2) NEDC-33101P states that the post-accident peak temperature and pressure do not significantly increase for EPU. For BFN EQ analyses, the EQ evaluations are performed using bounding peak values for temperature and pressure based on main steam line break (MSLB) and/or DBA-LOCA conditions. The CLTP bounding EQ peak temperatures and pressures for the drywell and wetwell are 336°F/65 psia and 177°F/50.7 psia, respectively. For EPU conditions, the calculated peak temperatures and pressures for the drywell and wetwell are 335.4°F/62.9 psia and 193°F/44.9 psia, respectively. The higher values (CLTP or EPU) were used for the EQ analyses. Thus, the only value that had the potential to change any EQ evaluations is the increased wetwell peak temperature. However, there is no safety-related electrical equipment located in the wetwell; therefore, EPU has no effect on equipment qualification.

3) NEDC-33101P states that the long-term post-accident temperatures inside containment increase. However, the increase in long-term post-accident temperatures was determined not to adversely affect the qualification of safety-related electrical equipment. For BFN EQ analyses, the EQ evaluations consider the temperature versus time profiles based on MSLB and/or DBA-LOCA conditions. For EPU conditions the post-accident temperature profiles are greater than the CLTP temperature profiles. Figures EEEB.10-1 and EEEB.10-2 are provided to show the comparison of drywell and wetwell temperature profiles for CLTP and EPU conditions.

For the EQ of equipment located inside containment, the EPU long-term temperature profiles based on MSLB/DBA-LOCA conditions were compared to the EQ test profiles for the specific equipment to ensure that the EPU conditions are enveloped by the test conditions. In cases where the test conditions do not completely envelop the EPU conditions, the long-term temperatures were further evaluated using the RCM Technologies System 1000 computer program (Arrhenius calculation) to demonstrate that the EPU conditions were within the qualification requirements for the affected equipment.

Figure EEEB.10-1: Drywell Temperature Profiles

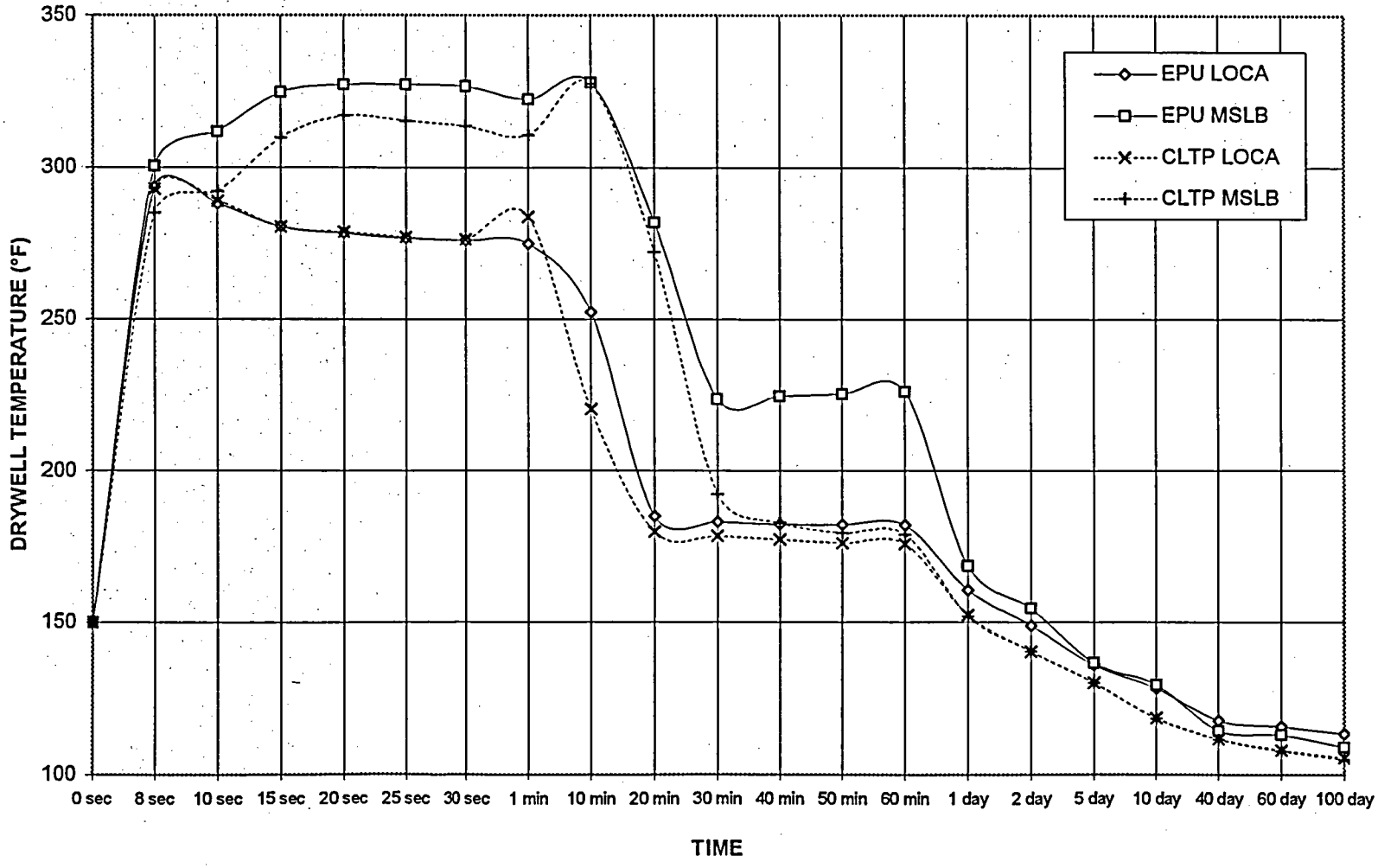
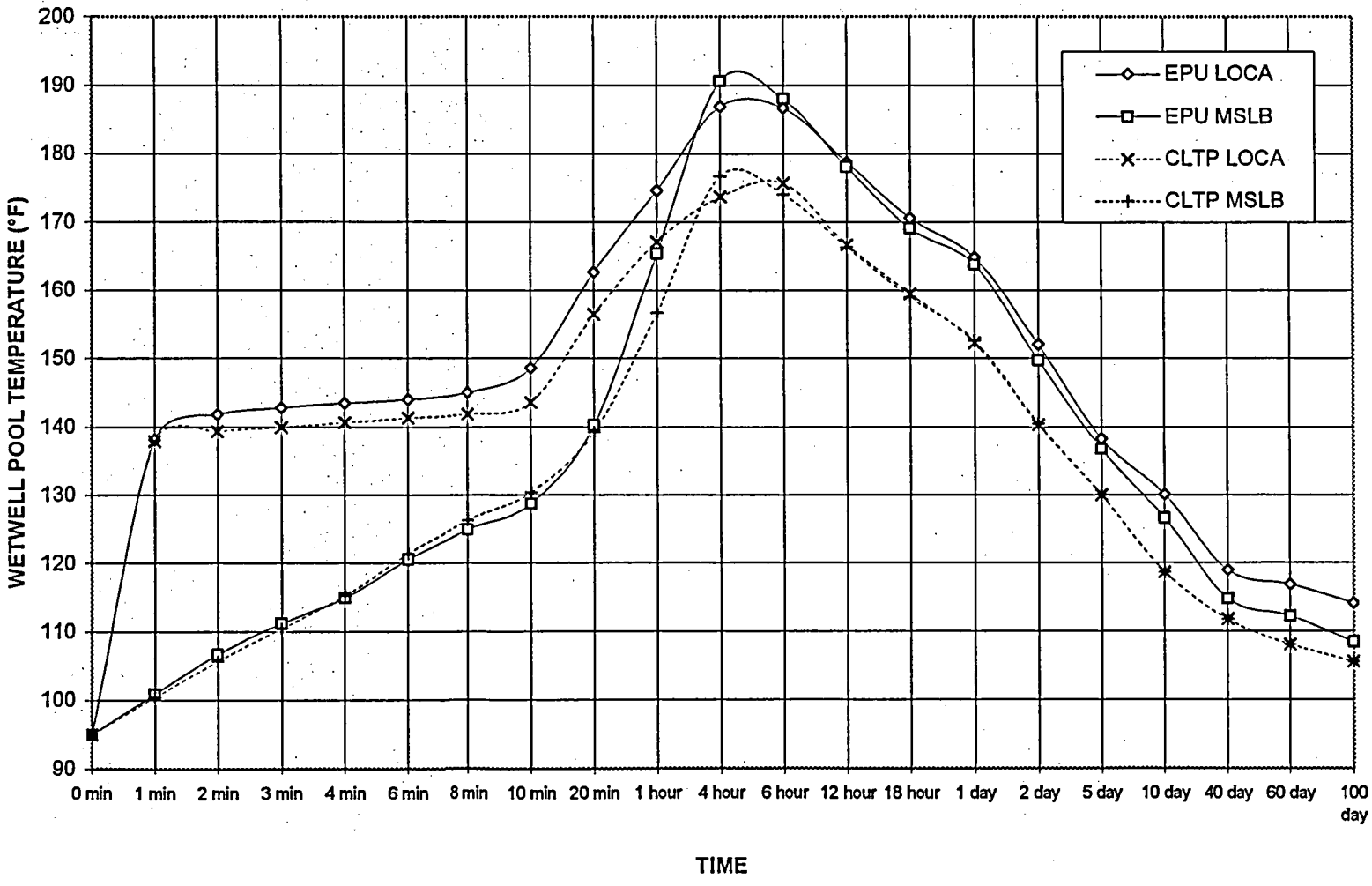


Figure EEEB.10-2: Wetwell Temperature Profiles



NRC Request EEEB.11

In Section 6.2 of NEDC-33101P regarding dc power, it is stated that the load addition for control logic relay associated with on-site power system changes are with existing margins. Please specify the amount of additional load on the dc system as a result of EPU and demonstrate that the additional load is within the existing design margin.

TVA Reply to EEEB.11

Subsequent to the preparation of NEDC-33101P, it has been determined that the modification associated with the load addition for control logic relays is no longer required. A review of the EPU modifications was performed to determine the impact to the DC system. The EPU modification (listed in Enclosure 3 of the March 7, 2006 submittals) that adds load to the DC system is:

> Main Bank Transformers - The existing transformer differential relays are replaced, resulting in approximately a 0.6 Amps DC total increase (0.2 Amp per Unit) to Non-Safety Related Battery #4 for the replacement of transformer differential relays on Units 1, 2, and 3.

Operation at EPU conditions does not increase any existing loads beyond their analyzed nameplate rating or revise any component operating duty cycle. There is no impact from EPU on the plant safety-related batteries. BFN calculations for the DC power systems contain built-in margin to account for minor load additions without re-performing the entire DC analyses. Load changes are evaluated in plant calculations as part of the design process. EPU changes are within existing battery system design margin. Therefore, the DC power distribution system remains adequate.

NRC Request CVIB.6

In the response to Nuclear Regulatory Commission (NRC) Request EMCB-A.3, it was stated that.

> the BWRVIP [Boiling Water Reactor Vessel and Internal Project]-25 report requires an EVT-1 examination from below the core plate, or UT [ultrasonic testing] from above the core plate, of 50% of the holddown bolts. If cracking is detected, the remaining 50% of the bolts will be inspected. Inspections for Unit 2 and Unit 3 have been extremely difficult to perform because of poor accessibility and high radiation conditions with fuel in an operating reactor pressure vessel. Presently, a VT-3 examination of accessible holddown bolts has been the best possible examination that can be performed for an operating RPV [reactor pressure vessel] to verify that the bolt is still performing its design function. Unit 1 performed an EVT-1 examination from below the core plate of 50% of the rim holddown bolts prior to restart since access below the core plate was available.

Based on the response to NRC Request EMCB-A.3, provide a discussion regarding the intention to either inspect the core plate holddown bolts in accordance with the BWRVIP inspection guidelines, install the core plate wedges, or develop an alternative to the inspections identified in BWRVIP-25 and submit it to the staff for review and approval prior to the period of extended operation.

TVA Reply to CVIB.6

TVA intends to develop an alternative to the inspections identified in BWRVIP-25 and submit it to the NRC staff for review and approval. The information will be submitted prior to the period of extended operation.

As stated in the Reply to NRC Request EMCB-A.3 in the EPU submittals dated March 7, 2006, TVA has previously committed (as part of the license renewal for BFN Units 1, 2, and 3) to perform a plant-specific analysis consistent with BWRVIP-25. In addition, in TVA's November 16, 2005, supplement to the license renewal application, it was stated that appropriate corrective action will be taken if the plant-specific analysis does not satisfy the applicable criteria. The installation of core plate wedges to eliminate the need for enhanced inspections of the core

plate hold-down bolts as recommended by BWRVIP-25 is considered an acceptable corrective action. The plant-specific analysis, or the corrective action taken to resolve the issue, will be submitted for the NRC staff review and approval. The information will be submitted two years prior to the period of extended operation.

NRC Request CVIB.7

In the response to NRC Request EMCB-A.4, it was stated that there is no inspection currently required for the grid beam and beam-to-beam crevice slot. However, the NRC staff's Safety Evaluation for BWRVIP-26 dated December 7, 2000, states that the threshold fluence level for irradiation-assisted stress-corrosion cracking is 5×10^{20} n/cm^2.

Address the inspection activities that will be performed on the critical top guide components in the refueling outage following power uprate. This discussion should address enhanced visual testing of the top guide grid beams and the conformance of these tests in accordance with Service Information Letter (SIL) 554 following the sample selection and inspection frequency of BWRVIP-47 for the control rod drive guide tubes. Additionally the discussion should address the inspection percentage and time frame for the total population of cells. Selection of the cells should be discussed including intentions to bias the cell selection to the highest fluence areas in the top guide.

TVA Reply to CVIB.7

TVA will commence inspections of critical top guide components during the refueling outages following EPU operation for each of the three BFN units. Enhanced visual testing (EVT-1) of top guide grid beams will be performed in accordance with GE SIL 554 following the sample selection and inspection frequency of BWRVIP-47 for CRD guide tubes. That is, TVA will perform inspections of 10% of the total population of cells within twelve years, with one-half (i.e., 5%) to be completed within six years. The six-year intervals will be defined to be the same as those for the CRD guide tubes. Selection of the top guide cells will be biased to the highest fluence areas of the top guide. If cracking is found, the inspection sample size would be expanded. In this regard, TVA intends to follow the guidelines of BWRVIP-26. The inspection protocol and sample size are subject to modification if BWRVIP-26 is revised.

NRC Request CPTB.1

Additional information is required to clarify the evaluation of EPU physical modifications and conditions on the renewed operating license. It is understood that the License Renewal Application (LRA) was decoupled from the EPU application, but the effects of the planned power uprate on the LRA were evaluated and the results were presented in the enclosure to TVA letter dated August 3, 2004. In this document, the operating characteristics that potentially affect the identified aging mechanisms were identified to verify the LRA remained valid. It is known that the configuration considered in the LRA scope and aging management review (AMR) table is the configuration that will exist at restart for BFN Unit 1. It is also recognized that the configuration identified in the LRA includes the physical changes that are identified in Appendix F of the LRA to be completed prior to restart for BFN Unit 1. The currently planned configuration changes that will exist as a result of the proposed EPU are identified in the EPU applications submitted by letters dated June 25 and June 28, 2004, as supplemented, and it is understood that the EPU is expected to coincide with restart. Since the EPU is decoupled from the LRA, it is not clear to the staff if these planned physical changes and conditions identified in the EPU application are still bounded by the LRA scope, AMR tables and AMP scope or if these EPU changes have been or will be evaluated separately for license renewal aging management as part of either the EPU application or in a 10 CFR 50.59 evaluation reflected in the annual update.

Provide a discussion on how the structures, systems and components that were included within the scope of the LRA are going to be impacted by the EPU modifications and conditions. Specifically, provide the following information:

a) Confirm the timing of the planned EPU physical changes to components within scope of license renewal and clarify how and where these physical changes have been or will be evaluated for license renewal aging management. If all planned EPU physical changes will be in place at restart and, thus, are bounded by the aging management review in the LRA, identify these specific physical changes and clarify how and where they are evaluated in the LRA. If certain planned EPU physical changes have not been evaluated for aging management in the LRA, clarify how and where they are or will be evaluated.

b) Considering that the LRA and EPU applications were decoupled, clarify how and where the operating conditions that will exist as a result of EPU have been, or will be,

evaluated for license renewal aging management. If these new operating conditions are bounded by the aging management review in the LRA, identify these specific operating conditions and clarify how and where they are evaluated in either the LRA or EPU. If certain planned EPU conditions have not been evaluated for aging management in the LRA, clarify how and where they are or will be evaluated. For example, clarify if the conclusions on operational characteristics reached in TVA letters dated January 28, August 3, and August 5, 2004, concerning effects of the EPU on the LRA still remain valid or clarify if these changes are to be addressed as part of the EPU evaluation.

c) Where additional components, materials, environments and aging effects/mechanisms are identified as a result of the EPU applications that were not included in the LRA, identify those specific components for each system and clarify how the aging management review was or will be performed and how the aging management program scope was or will be expanded. If the existing LRA AMR tables or AMP scope do not bound the new EPU components, materials, environments and aging effects/mechanisms, submit new AMR tables and programs as appropriate.

TVA Reply to CPTB.1

The License Renewal Application (LRA) for BFN Units 1, 2, and 3 was developed in parallel with the Extended Power Uprate (EPU) license amendment requests for BFN Units 1, 2, and 3. The conditions resulting from EPU implementation were reviewed during the license renewal process to determine any impact on the LRA. As would be expected, changes in operating conditions associated with EPU implementation were identified as having potential impacts on the LRA. Accordingly, EPU conditions were evaluated and incorporated into the LRA as appropriate (see item (b) below). Additionally, physical modifications associated with EPU would be expected to have no impact on the scope of the LRA as these modifications consist of modifying existing systems with new replacement components and equipment. EPU modifications have been preliminarily reviewed and are not anticipated to change the LRA scope (see item (a) below).

a) The majority of the EPU modifications have not yet been implemented, and the final review of the modifications is not complete. A small number of Unit 1 EPU modification reviews had been completed at the time of the LRA (included in the annual updates) and were included in the LRA scope. Based on final reviews to date and preliminary reviews of EPU physical design changes, no impact to the aging

management in the LRA is anticipated. The EPU modifications involve installation of new components and equipment which would have a positive impact on aging management. Components and equipment utilized for EPU modifications are of similar materials and design as the original equipment and, to date, have not involved any new aging management issues, nor are they likely to.

In accordance with the provisions of 10 CFR 54.37(b), newly identified systems, structures, and components that would have been subjected to an aging management review or evaluation of time-limited aging analyses will be included in FSAR updates required by 10 CFR 50.71(e). The next FSAR update is scheduled to occur 6 months following the Unit 2 Spring 2007 refueling outage.

b) The review of EPU conditions was performed as part of the LRA. The conclusions on operational characteristics reached in TVA letters dated February 19, 2004 (January 28, 2004, Meeting Follow-up), May 28, 2004 (as updated by letter dated August 5, 2004), and August 3, 2004, concerning effects of the EPU on the LRA still remain valid for license renewal.

As previously discussed in the August 3, 2004, submittal, the Browns Ferry LRA was developed in parallel with the EPU submittal. The February 19, 2004, letter provided additional information discussing the effects of EPU on the LRA. That letter concluded that all evaluations in support of the LRA were valid at the EPU power level, except those associated with Section 4.3, Metal Fatigue. LRA Sections 4.2 and 4.3 were later updated by the letters dated May 28, 2004, and August 5, 2004, to reflect EPU conditions. Attachment 1 of the August 3, 2004, letter identified the changing operational characteristics that potentially affected the identified aging mechanisms following EPU. These operational characteristics were reviewed for the systems affected, as delineated in Attachment 2 of that letter, to verify the license renewal application remains valid.

c) No additional components, materials, environments and aging effects/mechanisms have been identified as a result of the EPU application that were not included in the LRA. As stated in item (a) above, the physical modifications associated with EPU are not anticipated to impact the aging management based on preliminary reviews. Final reviews will be completed post-implementation in accordance with TVA design processes and the aging management program. Also, as stated in item (b) above, the review of EPU operating

conditions was previously performed and appropriately incorporated into the LRA.

NRC Request IOLB.1

During a conference call on April 25, 2006, TVA stated that the change in plant parameter values associated with EPU conditions could affect the timing of actions provided in the Emergency Operating Instructions (EOIs) and Abnormal Office Instructions (AOIs). Describe any changes resulting from the EPU on the available time and the actual time it takes for these operator actions. Provide the times for both current conditions and proposed EPU conditions. The scope of action times to be addressed should be those credited in the safety analyses in the Updated Final Safety Analysis Report, Chapter 14, Plant Safety Analysis.

TVA Reply to IOLB.1

See TVA Reply to question IOLB.2, below.

NRC Request IOLB.2

Discuss how TVA will validate that times available for the proposed EPU, will be adequate for operators to reliably perform the timing of actions provided in the EOIs and AOIs.

TVA Reply to IOLB.2

TVA previously provided a discussion of BFN operator actions and the effect on Emergency Operating Instructions (EOIs) and Abnormal Operating Instructions (AOIs) in the reply to NRC requests IROB.B-1 and IROB.B-2 in the letter dated December 19, 2005. The previous TVA reply and the above additional questions were further discussed with the NRC staff during a conference call on April 25, 2006. During this call, the additional request was clarified. TVA and NRC agreed that operator action times for operator actions credited in the safety analyses in the Updated Final Safety Analysis Report (UFSAR) Chapter 14, "Plant Safety Analysis," would provide the additional information needed.

This response supplements the information previously provided in the reply to NRC requests IROB.B-1 and IROB.B-2 in the letter dated December 19, 2005.

As discussed in the April 25, 2006 conference call with the NRC staff, Table IOLB.2-1 is provided to further clarify the EPU effect on operator actions credited in safety analyses that support the design basis accidents of UFSAR Chapter 14. This table provides the available time (time assumed in the analysis

from beginning of accident to completion of action) and actual time (time it takes the operator to perform the action from initiation of the action to completion of action) for both current licensed thermal power (CLTP) and EPU conditions.

BFN was designed to mitigate the consequences of design basis accidents automatically with a minimum of manual operator actions. Most safety systems were designed to rely on automatic system actuation to ensure that the safety system were capable of carrying out their intended functions. In a few cases, limited operator actions are employed. As indicated in Table IOLB.2-1, only a small number of the manual operator actions are credited in these analyses. Two of these actions are credited within the first 60 minutes of the accident, and these manual operator action times were unchanged for EPU. Only one of the operator action times (CAD required start time) was revised for EPU and the time frame for this action is so great as to not affect the ability of the operator to perform this action in a timely manner. The CAD required start time is further discussed in PUSAR Section 4.7, "Post-LOCA Combustible Gas Control."

Table IOLB.2-1

Compilation of Manual Operator Actions in Design Basis Accident Analyses

Manual Operator Action Credited in Safety Analysis	1) Available Time		2) Actual Time		Comments
	CLTP	EPU	CLTP	EPU	
Initiate suppression pool cooling (DBA-LOCA Containment Analysis)	10 minutes	10 minutes	5 minutes	5 minutes	1) The available time for this action is based upon the assumed time utilized in the containment analysis. Although EPU conditions affect the suppression pool heatup rate in the containment analysis, the assumed time for initiating suppression pool cooling was not changed for the EPU analysis and the resulting peak pool temperature was allowed to increase for EPU conditions. The containment analysis was performed for EPU conditions and the results of the analysis (as compared to CLTP conditions) are reflected in PUSAR Section 4.1, "Containment System Performance." 2) The actual time for the performance of this action is based upon conservatively bounding operator experience. EPU does not affect the steps that are required for the operator to align the RHR system to suppression pool cooling.

Table IOLB.2-1

Compilation of Manual Operator Actions in Design Basis Accident Analyses

Manual Operator Action Credited in Safety Analysis	1) Available Time		2) Actual Time		Comments
	CLTP	EPU	CLTP	EPU	
Initiate drywell spray (Steam Line Break Containment Analysis)	11 minutes	11 minutes	2 minutes	2 minutes	1) The available time for this action is based upon the assumed time utilized in the containment analysis. Drywell spray is assumed to be initiated when the drywell temperature exceeds 280°F plus 60 seconds. If 280°F was reached prior to 10 minutes, the minimum allowed response time was 11 minutes. This assumed time was not changed for the EPU analysis. For the limiting larger steam line breaks, the drywell temperature exceeds 280°F prior to ten minutes both in the pre-EPU and EPU cases; therefore, the minimum allowed response time of 11 minutes is not affected. For smaller steam line breaks, the time to reach 280°F could be longer than ten minutes which would provide adequate time for operator action in both pre-EPU and EPU conditions. 2) The actual time for the performance of this action is based upon conservatively bounding operator experience. EPU does not affect the steps that are required for the operator to align the RHR system to drywell spray.

Table IOLB.2-1

Compilation of Manual Operator Actions in Design Basis Accident Analyses

Manual Operator Action Credited in Safety Analysis	1) Available Time		2) Actual Time		Comments
	CLTP	EPU	CLTP	EPU	
SLC system injection (DBA-LOCA Radiological Consequences)	Injection initiation within 2 hours	Injection initiation within 2 hours	2 minutes	2 minutes	1) The available time for this action is based upon the assumed time utilized in the Alternate Source Term (AST) radiological analyses. The current AST analyses were performed conservatively to envelope EPU conditions. Therefore, there are no changes associated with EPU implementation. 2) The actual time for the performance of this action is based upon conservatively bounding operator experience. For this event, SLC is initiated after receiving the alarm for high drywell radiation. More than adequate time is available for operator action compared to the time needed for actual actuation. EPU does not affect the steps that are required for the operator to initiate the SLC system.

Table IOLB.2-1

Compilation of Manual Operator Actions in Design Basis Accident Analyses

Manual Operator Action Credited in Safety Analysis	1) Available Time		2) Actual Time		Comments
	CLTP	EPU	CLTP	EPU	
Required start time for CAD system initiation (DBA-LOCA Combustible Gas Control)	42 hours	32 hours	5 minutes	5 minutes	1) The available time for this action is based upon the calculation of post-LOCA production of hydrogen and oxygen by radiolysis. This production is directly affected by EPU and the results of the analysis are reflected in PUSAR Section 4.7, "Post-LOCA Combustible Gas Control." 2) The actual time for the performance of this action is based upon conservatively bounding operator experience. Post-LOCA Hydrogen/Oxygen levels in the drywell are monitored during the accident and will provide adequate warning of the need for CAD system operation. EPU does not affect the steps that are required for the operator to initiate the CAD system.

NRC Request SBPB.14

The response provided in the March 7, 2006 submittals to RAI SPLB-A.5 stated that:

> the turbine and turbine control system design changes for EPU are in progress and the specific control setpoints have not been established. The setpoints will be adjusted to ensure that the turbine will not exceed 120% of rated speed due to overshoot.

Provide a discussion addressing to what extent the proposed EPU will affect the existing turbine overspeed protection capability, including a discussion of turbine overshoot during a loss of electrical load and supporting analyses that are credited, the effects of turbine modifications that will be completed, and post-modification testing that will be completed to confirm that the analytical results are correct.

TVA Reply to SBPB.14

EPU modifications for the main turbine include new rotors for Unit 1 (monoblock design) and new buckets (heavier design) and diaphragms for all three units to increase flow capacity for the proposed EPU operations. The new buckets for all three units as well as the monoblock design for Unit 1 increase the rotor inertia which slows the acceleration rate of the machine should a load rejection event occur. However, the entrapped steam energy contained within the turbine and the associated piping after the valves close also increases slightly for EPU which increases the acceleration rate of the machine should a load rejection event occur. As stated in PUSAR Section 7.1, the overspeed calculation compares the entrapped steam energy contained within the turbine and the associated piping, after the stop valves trip, and the sensitivity of the rotor train for the capability of overspeeding.

The scenario considered is the emergency case where the EHC controls and the Control and Intercept Valves fail to respond to the initial speed increase due to a load rejection event. For this scenario, the unit rapidly accelerates to the overspeed trip setpoint, thereby trip closing the main and intermediate stop valves. The operating condition analyzed was the maximum power, Valves Wide Open case, with low backpressure. This approach accounts for the two basic contributors to peak overspeed due to a load rejection event: 1) the energy due to entrapped (or entrained) steam within the steam path and inlet piping downstream of the main and intermediate steam valves; and 2) what is termed "valve lag overspeed," which takes into account the

energy contributed by new steam entering the machine during response time of the control and trip systems, and during the actual closing time of these valves. The overspeed trip setpoint is established such that the resulting peak speed will not exceed the 120% emergency overspeed limit due to overshoot. This ensures that the turbine is protected in an overspeed event.

The BFN main turbines are provided with overspeed protection to ensure that the turbines do not exceed 120% of rated speed for any condition. The emergency overspeed protection is an independent two out of three electronic trip device with independent speed sensors that detect turbine speed and sends a signal to the master trip solenoid valve (MTSV) on a detected overspeed condition. The current BFN Units 2 and 3 emergency overspeed setpoint is 109%. Electronic overspeed protection is also part of the digital EHC system. The digital EHC system will also send a trip signal to the MTSV on a detected overspeed condition from independent speed sensors. The digital EHC overspeed setpoint is set less than or equal to the emergency overspeed protection setpoint.

With the modifications to the main turbine for EPU conditions, the turbine overspeed calculation has determined that a setpoint of 109.5% will provide emergency overspeed protection. This setpoint will result in an emergency overspeed peak at 118.99% on Unit 1 and 119.04% on Units 2 and 3 following a full load rejection event, concurrent with the unlikely assumption that the EHC controls and/or the control and intercept valves have failed to respond to the initial speed increase. These are below GE's emergency overspeed peak speed limit requirement of 120%.

Therefore the existing emergency overspeed trip setpoint of 109% for Unit 2 and Unit 3 remains conservative and a setpoint change will not be required. The 109% emergency setpoint will also be utilized for Unit 1.

Post-modification testing to confirm the analytical results is not practical as this would require disabling turbine protective features and rapidly increasing turbine speed to the overspeed trip setpoint. However, post-modification testing of the overspeed function will be performed as part of the EPU startup testing. For Unit 1, overspeed functional testing will be conducted at no load as part of post-modification testing for the digital EHC upgrade modification on Unit 1. This test will bring the turbine up to the overspeed setpoint and confirm proper overspeed trip function with the generator offline and the reactor power within the bypass valve capacity. For BFN Units 2 and 3, overspeed functional testing will be conducted via signal simulation. An emergency overspeed trip logic function test will be conducted by inserting simulated speed signals to validate the overspeed trip signal to the MTSV is received at the

emergency overspeed setpoint. The turbine trip output from the EHC digital control system will also be tested for proper trip signal initiation to the MTSV. The MTSV is functionally tested weekly.

ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3

TECHNICAL SPECIFICATIONS (TS) CHANGES TS-431 AND TS-418 - EXTENDED POWER UPRATE (EPU) - RESPONSE TO ROUND 5 REQUEST FOR ADDITIONAL INFORMATION (TAC NOS. MC3812, MC3743, AND MC3744)

COMMITMENT SUMMARY

TVA will commence inspections of critical top guide components during the refueling outages following EPU operation for each of the three BFN units. Enhanced visual testing (EVT-1) of top guide grid beams will be performed in accordance with GE SIL 554 following the sample selection and inspection frequency of BWRVIP-47 for CRD guide tubes.